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ABSTRACT

An experimental study of the interpretation of lexical anaphors and pronouns by Icelandic-speaking children is reported. The standard binding theory of English is reviewed, and problems in the application of the theory to Icelandic, which has long-distance antecedents, are discussed. A parameterized binding theory constructed to account for the variation between languages is outlined and tested with data from 120 Icelandic children, aged 2-6, and 15 adult control subjects. Results show that the Icelandic children and adults strongly prefer a long-distance antecedent in the reflexive, and that this preference gets stronger as the children get older. The findings conflict with the subset principle of the parameterized binding theory and the evidence supporting it in studies of Chinese and Korean, which appear to have a similar kind of reflexive allowing both local and long-distance binding. An explanation for this is found not in problems with the subset principle but in differences in the target grammars. It is concluded that Icelandic does not provide evidence for the parameterized binding theory, contrary to current assumptions, and that the standard binding theory is preferable. (MSE)

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The Acquisition of Reflexives and Pronouns by Icelandic Children

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In this paper we report the results of an experimental study on the interpretation of lexical anaphors and pronouns by Icelandic-speaking children. In recent years there have been many studies on children's acquisition of lexical anaphors and pronouns. Most of these studies have been concerned with English-speaking children, for example, Wexler & Chien (1985); Chien & Wexler (1987a) ; Otsu (1981); Jakubowicz (1984); Solan (1987); McDaniel, Cairns & Hsu (1987), but more recently studies have been conducted on children acquiring other languages, for example, Chinese (Chien and Wexler 1987b), Korean (Lee and Wexler 1987), Dutch (Koster and Koster 1986) and Italian (Crain and McKee 1987). The cross-linguistic study of the development of binding in children has proceeded in tandem with research on binding in adult languages. In the course of the investigation of adult languages it has been revealed that not all languages obey the same binding conditions as English. A case in point are the so-called long-distance reflexives found in various languages, such as Icelandic, Chinese and Korean. Languages which have binding properties that are distinct from English are of particular interest for linguistic theory as these languages seem to challenge the standard binding theory of Chomsky (1981).

The standard binding theory, as introduced in Chomsky (1981), consists essentially of two principles, principles A and B which can be informally reformulated as in (1):

(1) Principle A: An anaphor must be locally bound
Principle B: A pronoun may not be locally bound

where the term 'bound' means 'c-commanded by and coindexed with its antecedent' and for our present purposes 'local' means within the same clause.

The standard binding theory in (1) correctly accounts for English anaphors and pronouns, as illustrated in (2), and indeed for anaphors and pronouns across a number of different languages.

(2) a) John shaves himself
b) *John told Bill to shave himself
c) *John shaves him
d) John told Bill to shave him

(underlined NPs are coreferent)

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However, there are languages with reflexives and pronouns that cannot be correctly accounted for by the standard binding theory. Icelandic is one of the languages that has binding properties which are different from English. The following is a brief description of the Icelandic facts. The reflexive element sig in Icelandic is equivalent in meaning to English himself/herself. Sig is a 3rd person form which is invariant for gender and number, but which has three different case forms as illustrated in (3):

(3) Sig = himself/herself
3rd pers. m./f./n. sg./pl. acc. sig
dat. sér
gen. sín

As first outlined in Thráinsson (1976a,b), the reflexive element sig in Icelandic can have a non-local, that is "long-distance antecedent." When sig occurs in a single clause sentence, it behaves just like himself/herself in English, that is, it adheres to principle A in (1). This is illustrated in (4).

(4) Jón rakar sig
John shaves himself

The difference between Icelandic sig and English himself/herself shows up in sentences with complement clauses. Here we find that sig may take a long-distance antecedent when the clause that contains sig is subjunctive or infinitive. However, if sig is contained in an indicative clause, it can normally only refer to the local antecedent. There is an additional requirement in Icelandic which is that a long distance antecedent must be a subject, but this need not concern us here. Consider the sentences in (5)-(7):

(5) Kermit$_i$ segir að Jón$_j$ gefi$_{(subj.)}$ sér$_{i/j}$ bíl
Kermit says that John gives sér a car

(6) Kermit$_i$ segir Jóni$_j$ að gefa$_{(inf.)}$ sér$_{i/j}$ disk
Kermit tells John to give sér a plate

(7) Kermit$_i$ sér að Jón$_j$ gefur$_{(ind.)}$ sér$_{*i/j}$ flautu
Kermit sees that John gives sér a whistle

The complement clauses in sentences (5) and (6) are subjunctive and infinitive clauses, respectively. Thus, in these sentences, sér, which is the dative form of the reflexive element sig, can either have the local subject John or the matrix subject Kermit as its antecedent, as is indicated by the subscripts. In contrast, when the complement clause is an indicative clause, as in sentence (7), sér can normally only take the local subject John as its antecedent.

Turning now to Icelandic pronouns, honum which corresponds to English him and henni, which corresponds to

English her, both obey principle B of the binding theory, as given in (1). Thus, Icelandic pronouns may not be locally bound. Thus, the sentence in (8) is just as ungrammatical in Icelandic as it is in English:

(8) *Jón rakar hann
John shaves him

However, there is a difference between the binding properties of Icelandic and English pronouns. When the Icelandic pronoun is contained in a subjunctive or indicative complement clause, it can refer to a NP in the higher clause, as well as to an extra-clausal NP, as is the case in English. However, if the pronoun is contained in an infinitival complement, speakers' intuition is that it cannot refer to the subject of the higher clause. Consider the sentences in (9)-(11):

(9) Svínka$_i$ segir að Sara$_j$ gefi$_{(subj.)}$ henni$_{*j/i/k}$ bíl
Miss Piggy says that Sarah gives her a car

(10) Svínka$_i$ sér að Sara$_j$ gefur$_{(ind.)}$ henni$_{*j/i/k}$ bíl
Miss Piggy sees that Sarah gives her a car

(11) Svínka$_i$ segir Söru$_j$ að gefa$_{(inf.)}$ henni$_{*j/*i/k}$ bíl
Miss Piggy tells Sarah to give her a car

In sentences (9) and (10), which have complement clauses in the subjunctive and indicative moods, respectively, the pronoun can have either the matrix subject Miss Piggy or some extra-clausal NP as its antecedent. In contrast, when the pronoun is contained in an infinitival clause, as in sentence (11), there is a strong preference for it to refer to some extra-clausal NP rather than the matrix subject. There are a number of other properties of Icelandic anaphors and pronouns but these basic facts suffice for our purposes.

To account for the observed variation between languages, Yang (1984) and Wexler and Manzini (1987) propose a parameterized binding theory. According to Wexler and Manzini, the locality condition in principles A and B is a parameter which can be reformulated roughly as in (12):

(12) a local clause contains the anaphor or pronoun and;

a) has a subject; or
b) has an INFL; or
c) has a Tense; or
d) has an indicative Tense; or
e) has a root Tense

On Wexler and Manzini's account English anaphors and pronouns would be associated with value (a) of the parameter, whereas the Icelandic reflexive would be associated with value (d). The Icelandic pronouns take value (a) and there are other languages which pick out the remaining values.

In order to account for how the child ultimately arrives at the correct parameter setting, Wexler and Manzini (1987), following Berwick (1982), propose the Subset Principle, a learning algorithm which seems to be a necessary condition to assure learning without negative data. The Subset Principle is given informally in (13):

(13) The learning function maps the input data to the value of a parameter which generates a language:
a) compatible with the input data, and
b) smallest among the languages compatible with the input data

According to this principle the child hypothesizes the smallest language compatible with the data. Wexler and Manzini further propose that the value which generates the smallest language constitutes the default or unmarked setting of the parameter, hence the one that all children should start out with and one which may be later revised on the basis of positive evidence. Incorporating the Subset Principle into a developmental theory, we have a very explicit prediction regarding the development of the binding module. For anaphors, a grammar that only allows local binding defines a smaller language than a grammar which licenses long-distance binding. Hence, we expect that all children will start out by assuming local binding for reflexives; that is, value (a) of the locality parameter in (12) will be the child's first assumption, even in the case of languages where the grammar licenses long-distance binding such as Icelandic. Our experiment was designed to test the hypothesis that Icelandic children would initially bind the reflexive sig only to its local antecedent.

We tested 120 Icelandic children between the ages of 2;0-6;0, and 15 adult controls on anaphor resolution in 3 sentence types, sentences with indicative, subjunctive and infinitival complements. Examples of the sentences used are given in (5)-(7) and (9)-(11) (above). The names John and Sarah were replaced by the name of the child who was being tested. We used an act-out task, the Party Game, which was developed by Chien and Wexler (1987a), in which the child is asked to perform an action given in a sentence. For example, the child is given the sentence "Miss Piggy says that John gives sér a truck," and has to select a truck from several toys on the table and give it either to himself or to one of four dolls present. The children were divided into 7 groups of six-month intervals based on their ages. Each group included 15 subjects.

The experimental results with sentences containing the anaphor sér are represented in figures (1)-(3) on the following page. In each figure the age group is listed along the abscissa and the frequency along the ordinate. The line with squares indicates coreference with the child, that is, a local antecedent response; the line with crosses indicates coreference with the doll mentioned in the sentence - the long distance antecedent; the line with diamonds indicates

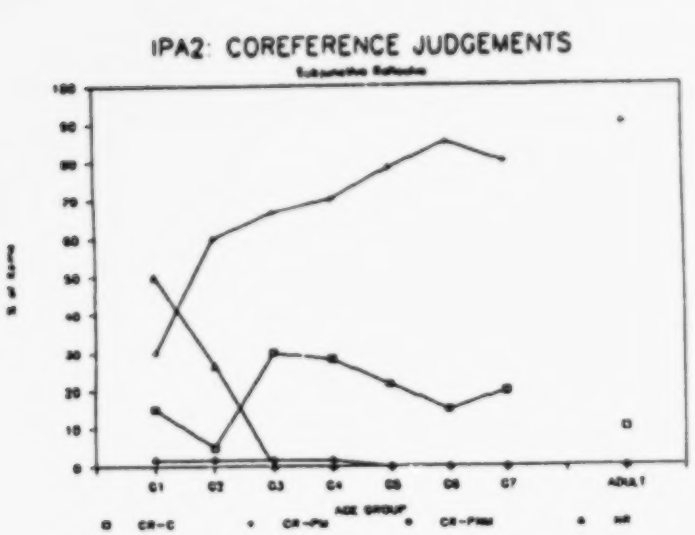

Figure 1 Subjunctive Reflexive

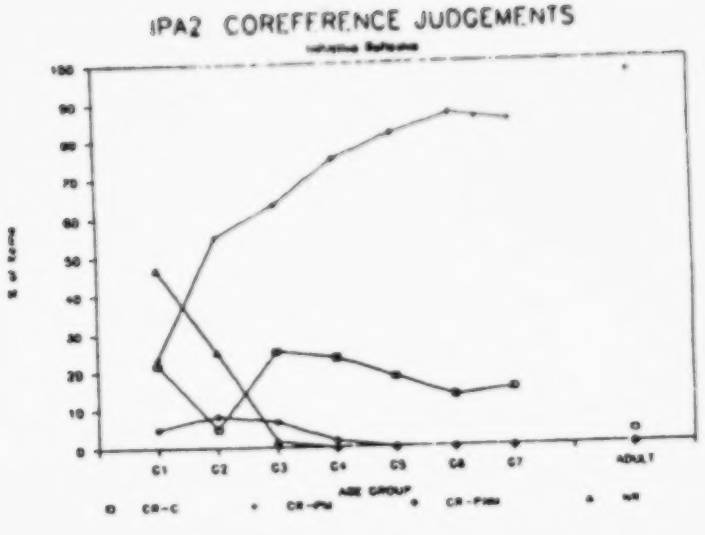

Figure 2 Infinitive Reflexive

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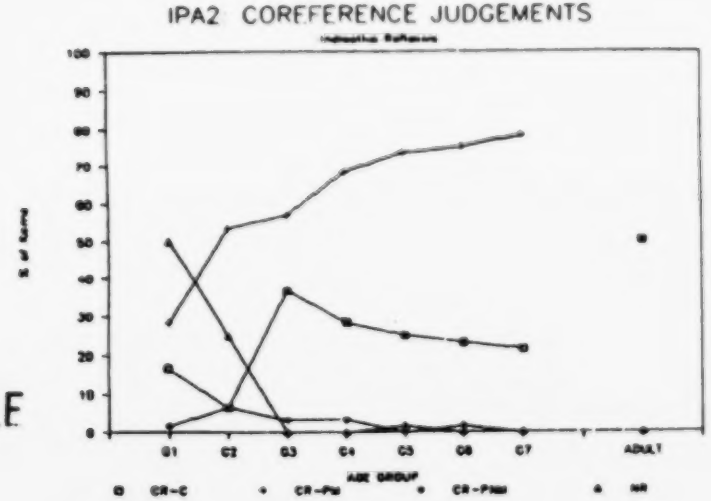

Figure 3 Indicative Reflexive

coreference with the doll not mentioned - an outside NP; and the line with triangles indicates no -response. The results show that Icelandic children consistently prefer the long-distance antecedent for the reflexive over the local antecedent. F (1,98) = 96.48, $p<.01$. Even the youngest children prefer the long distance antecedent, although many of the 2;6-3;6 year olds, represented by G1 and G2, fail to respond. Interestingly, long distance responses predominate across all three sentences types- subjunctive, infinitive and indicative - despite the fact noted in sentence (7) that when the reflexive sig is contained in a indicative clause, only a local antecedent is judged grammatical.

Notice, however, that the children are not alone in making this "mistake" as the adults also allow sig to refer to the long-distance antecedent 50% of the time in the indicative sentences. We believe that there are two factors which contribute to this particular result. First, for many speakers indicative complements to semifactive verbs like sja "see", behave like subjunctive clauses in allowing long distance antecedent. Thus, some speakers find the sentence in (7) grammatical when the reflexive ser refers to the long-distance antecedent (see for example Sigurdsson (1986). Unfortunately, we were unawere of this dialect variation when we designed the test sentences. It is likely that among the children tested there were at least some speakers of this less restrictive dialect. In addition, it is probable that during the early stages children do not distinguish the different moods and hence their grammar would fail to show the restriction against long distance binding in indicatives. A Wilcoxon Signed Ranks Test for Matched Pairs indicates that the trend of children's long distance responses to indicative sig sentences is significantly different from their long distance responses to subjunctive sig sentences ($p = .02$) and to infinitive sig sentences ($p = .03$), while the difference in long distance responses between subjunctives and infintives is not significant. This is consistent with the claim that at a relatively early age children do sort out the complex constraints on the long distance control of sig.

In summary, the Icelandic children and the adults strongly prefer a long-distance antecedent for the reflexive and this preference gets stronger as the children get older. Thus, the Icelandic children appear not to adhere to the prediction of the subset principle, since they do not initially assume local binding for the reflexive. This result is in marked contrast to the results obtained by Chien & Wexler (1987b) for Chinese and by Lee and Wexler (1987) for Korean. Those studies showed that the children strongly preferred the local antecedent even though these languages allow the reflexive to have a long distance antecedent. The strongest support for the subset principle comes from Lee and Wexler's study on Koerean, where children older than 4;6 preferred the local antecedent almost 100% of the time, whereas the adults preferred a long-distance antecedent about 62% of the time. Chien and Wexler's results on Chinese were consistent with the subset principle, but not supportive of

it since the adults preferred the local antecedent just as strongly as the children.

Thus, Icelandic children seem to exhibit a different developmental pattern from both Korean and Chinese children, although all three languages appear to have a similar type of reflexive, one which allows both a local and a long-distance binding in certain contexts. How is this difference to be accounted for? One apparent non-grammatical explanation for this difference is that our experiment biased the children towards a long-distance response by using the verb give in all the test sentences. Under the assumption that children think it is more natural to give something to someone other than themselves, the results would show a preponderance of long distance responses. However, this explanation cannot be maintained in light of the Chinese results noted above. This study adopted precisely the same experimental design as was used with the Icelandic children - the Party Game using only the verb give, and the Chinese children overwhelmingly preferred the local antecedent, that is, themselves.

The explanation that we want to propose for our results and for the differences obtained between children acquiring Korean and Chinese is that the problem does not lie with the Subset Principle nor with any other aspect of acquisition theory, but with differences in the target grammars. Thus, we want to argue that Icelandic does not in fact have a long-distance reflexive and that sig is actually a bound variable analogous to his in the English sentence in (14a):

(14) a. Everybody loves his mother
b. Everybody hopes that his mother is happy

Bound variables, unlike anaphors, typically enter into long distance dependencies as illustrated in the sentence in (14b). Although the details of this analysis would take us too far afield (but see Hyams & Sigurjónsdóttir, in preparation) it is independently motivated by a number of properties of adult Icelandic. More to the point, it allows us to explain why the Icelandic children behave differently from the children in the other studies, where we would argue that the elements being tested are anaphors, and hence are locally bound by the children as predicted by the Subset Principle. Thus, the Icelandic results are not directly relevant to the acquisition of principle A of the binding theory nor to the Subset Principle. What our results do tell us is that Icelandic children acquire the knowledge of how to handle the bound variable sig, very early in their linguistic development. In addition, the analysis indicates that Icelandic does not provide evidence for a parametrized binding theory, contrary to current assumptions. To the extent that the standard, non-parametrized binding theory can be maintained it is to be preferred since it simplifies linguistic theory and consequently the acquisition task.

Turning to the results of the pronoun sentences, we see in figures (4)-(6) on the following page that the Icelandic

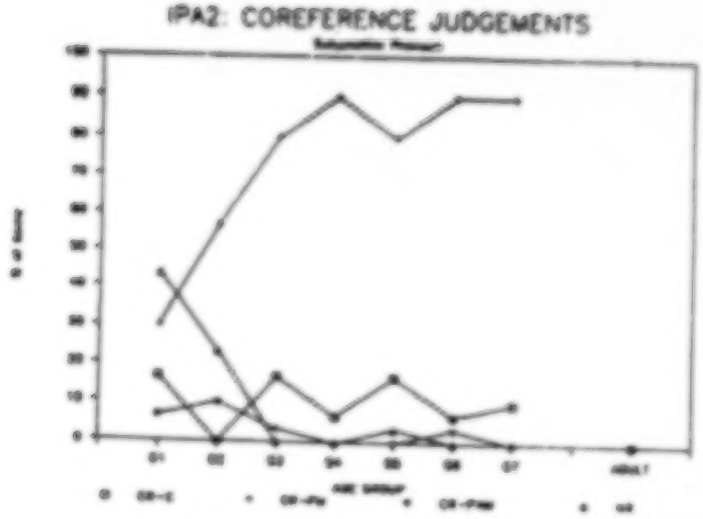

Figure 4 Subjunctive Pronoun

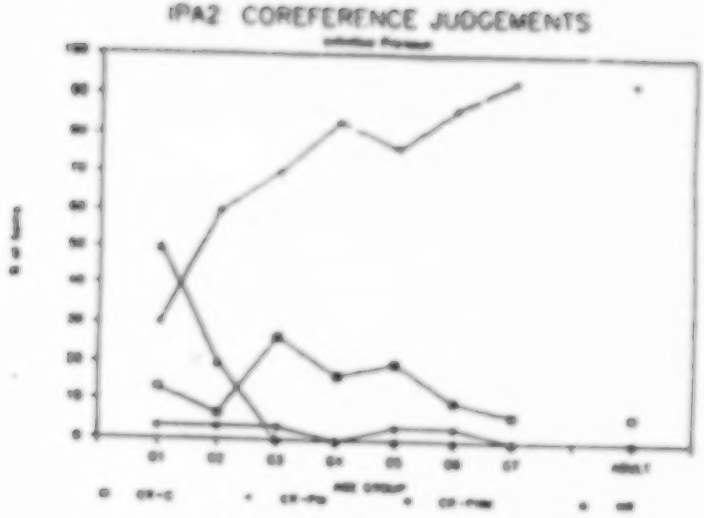

Figure 5 Infinitive Pronoun

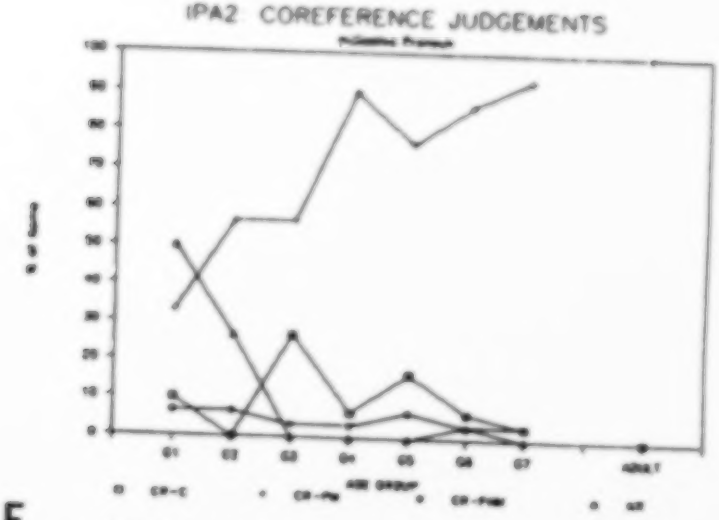

Figure 6 Indicative Pronoun

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children do quite well on pronouns. Thus, they consistently choose the long-distance antecedent for the pronoun. Very few children allow the pronoun to refer to the extra-clausal referent, that is, to the doll which was present in the experimental setting but not mentioned in the test sentence. But this may be due to the fact that it is pragmaticaly more felicitous for a pronoun to refer back to a mentioned doll. This same factor may be responsible for the results obtained in the infinitive sentences, given in figure (5), where the children and the adults prefer the doll mentioned rather than the outside NP. Recall that adult judgments on infinitive sentences of this type usually indicate a strong preference for extra-clausal antecedent. Thus, to sum up the results of the pronoun sentences, Icelandic children have knowledge of principle B of the binding theory relatively early in their linguistic development, and they show a steady increase in performance as a function of age, reaching 90% correct by age 6;0.

Chien & Wexler (1987a), based on their study of English speaking children, propose that there is a developmental lag in the acquisition of pronouns relative to anaphors. While the Icelandic children do exceedingly well on pronouns, as do the Chinese speaking children in Chien & Wexler (1987b), our preliminary results suggest that in Icelandic as well, correct usage of pronouns may lag slightly behind correct performance with sig. These results will be discussed further in Hyams & Sigurjónsdóttir (in preparation).

In conclusion, the experimental results presented here shed light not only on the developmental question of how children determine the binding properties of referentially dependent elements, but has also led to a reformulation of a widely accepted analysis of the adult grammatical system. Hence, we hope to have shown that acquisition results can inform the theory of grammar.

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